

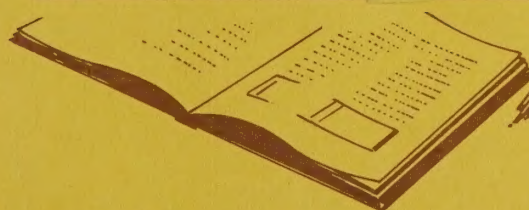
HEATHKIT[®] MANUAL

for the

AUTO PATCH ENCODER

Model VFA-2031-3

595-2242-02



HEATH COMPANY • BENTON HARBOR, MICHIGAN

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HEATH COMPANY
BENTON HARBOR, MI. 49022

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The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information (616) 982-3411
Credit (616) 982-3561
Replacement Parts (616) 982-3571

Technical Assistance Phone Numbers

8:00 A.M. to 12 P.M. and 1:00 P.M. to 4:30 P.M., EST, Weekdays Only
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Home Clocks (616) 982-3315
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Heathkit® Manual

for the

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HEATH COMPANY

BENTON HARBOR, MICHIGAN 49022

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INTRODUCTION

The Heathkit Model VFA-2031-3 Auto Patch Encoder allows you to make telephone calls through your VF-2031 Hand-Held 2-Meter Transceiver.

This accessory consists of a circuit board which contains a minimum of components and has a sealed keyboard built in. The circuit board mounts completely inside the front panel on the VF-2031 Transceiver and requires only three connections (plus a ground wire) between it and the Transceiver.

A crystal-controlled oscillator ensures stable operation and excellent frequency accuracy.

This accessory should prove to be a useful addition to your Transceiver and provide many hours of enjoyment.

ASSEMBLY NOTES

IMPORTANT: Before you begin to assemble this kit, be sure to read the information in the "Kit Builder's Guide."

1. When you perform the steps in the circuit board Pictorials, position each part as shown. Follow the instructions carefully and read the entire step before you perform each operation.
2. Due to the small foil area around some of the circuit board holes and the small area between the foils, use the utmost care to prevent solder bridges between adjacent foils. Use only a minimum amount of solder and a small tip soldering iron of not over 25 watts. Allow the iron to reach operating temperature; then apply it only long enough to make a good solder connection. If you think a solder bridge may exist, but you are not sure, compare the foil on the circuit board with the "Circuit Board X-Ray View" in the rear of this Manual.
3. To eliminate a solder bridge; hold the circuit board above the soldering iron and reheat the solder. As the solder melts; it will flow down the iron.
4. If your work surface is smooth, place the circuit board on a cloth to prevent it from sliding around when you solder component leads to the foil.
5. Resistors will be called out by their resistance value in Ω (ohms) or in $k\Omega$ (1000 ohms).

6. Capacitors will be called out by their capacitance value in pF (picofarads) or μF (microfarads) and type.
7. Each circuit part in an electronic kit has its own component number (R2, C4, etc.). Use these numbers when you want to identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:
 - In the Parts List,
 - At the beginning of each step where a component is installed,
 - In some illustrations,
 - In the Schematic,
 - In the section at the rear of the Manual.

Most kits use a separate "Illustration Booklet" that contains illustrations (Pictorials, Details, etc.) that are too large for the Assembly Manual. Keep the "Illustration Booklet" with the Assembly Manual. The illustrations in it are arranged in Pictorial number sequence.

SAFETY WARNING: Avoid eye injury when you clip off excess lead lengths. Hold the leads so they cannot fly toward your eyes.

PARTS LIST

Unpack the kit and check each part against the following list. The key numbers correspond to the numbers on the "Parts Pictorial" (Illustration Booklet, Page 1). Return any part that is packed in an individual envelope, with the part number on it, back in its envelope after you identify it until that part is called for in a step.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
------------	-------------------	------	-------------	----------------------

ELECTRONIC COMPONENTS

NOTE: The following resistors are 1/4-watt and have a tolerance of 5% (gold fourth band).

A1	6-331-12	1	330 Ω (orange-orange-brown) resistor	R101
A1	6-472-12	1	4700 Ω (yellow-violet-red) resistor	R104
A1	6-103-12	1	10 k Ω (brown-black-orange) resistor	R103
A2	10-990	1	1000 (1 k) Ω control	R102
A3	21-182	2	.047 μ F (473) ceramic capacitor	C101, C102

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Customer Service" inside the rear cover of your Transceiver Manual. For prices, refer to the separate "Heath Parts Price List."

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
------------	-------------------	------	-------------	----------------------

Electronic Components (cont'd.)

A4	56-19	1	VR-9.1 zener diode	D101
A5	404-238	1	3579.545 kHz (3.579545 MHz) crystal	Y101
A6	442-660	1	5087 integrated circuit	U101

MISCELLANEOUS

73-39	1'	Foam tape
75-103	1	Insulator paper

KEY No.	PART No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
------------	-------------	------	-------------	----------------------

Miscellaneous (cont'd.)

B1	100-1726	1	Keyboard assembly	
B2	258-730	4	Retainer clip	
B3	259-1	1	#6 solder lug	
	340-8	6"	Bare wire	
	347-55	12"	8-wire cable	
	462-1063	1	Pushbutton knob set (consists of 0-9, *, and #)	
B4	490-185	1	Package of desoldering braid	
			Solder	

KEY No.	PART No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
------------	-------------	------	-------------	----------------------

PRINTED MATERIAL

390-1503	1	Front label	
391-34	1	Blue and white label	
597-260	1	Parts Order Form	
	1	Instruction Booklet (See first page for part number.)	

STEP-BY-STEP ASSEMBLY

START

- () Position the circuit board with the printed (not the foil side) up. Then perform the steps in the following Pictorials.

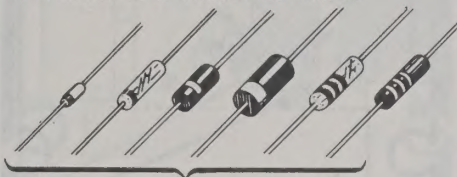
- () R102: 1000 (1k) Ω control. First bend the control leads at a right angle to the control. Then insert the leads into the holes within the outline for the control. Solder the leads to the foil and cut off the excess lead lengths.



- () R103: 10 k Ω (brown-black-orange).

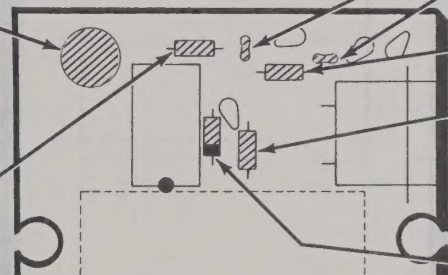
- () Solder the leads to the foil and cut off the excess lead lengths.

IMPORTANT: THE BANDED END OF DIODES CAN BE MARKED IN A NUMBER OF WAYS.



BANDED END

Detail 1-1A



PICTORIAL 1-1

CONTINUE

- () C101: .047 μ F (473) ceramic.
- () C102: .047 μ F (473) ceramic.
- () R104: 4700 Ω (yellow-violet-red).
- () R101: 330 Ω (orange-orange-brown).

NOTE: When you install a diode, always match the band on the diode with the band mark on the circuit board. A DIODE WILL NOT WORK IF INSTALLED BACKWARDS. See Detail 1-1A.

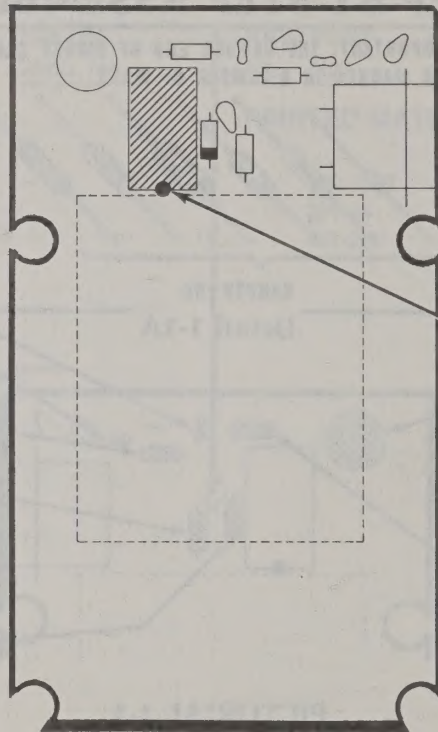
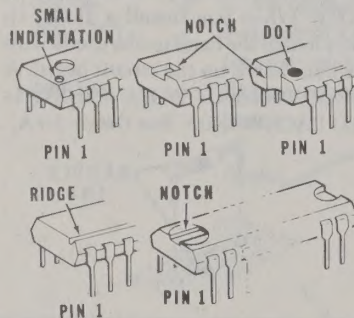


- () D101: VR-9.1 diode (#56-19).

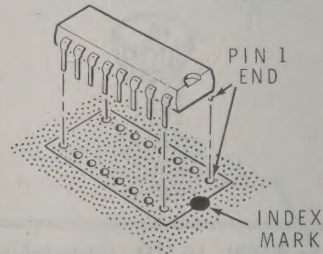
- () Solder the leads to the foil and cut off the excess lead lengths.

START

NOTE: The indexed (pin 1) end of in-line integrated circuits may be marked in a number of ways such as a notch, triangle, dot, the numeral 1, etc.


PICTORIAL 1-2
CONTINUE

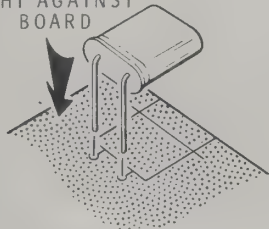
() U101: 5087 integrated circuit (#442-660). Position the pin 1 end of the IC over the index mark on the circuit board as shown. Then insert the pins into the circuit board and solder them to the foil. Cut off the excess pin lengths.



START ➡

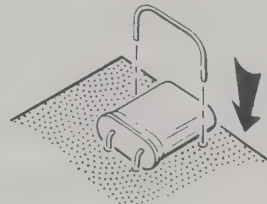
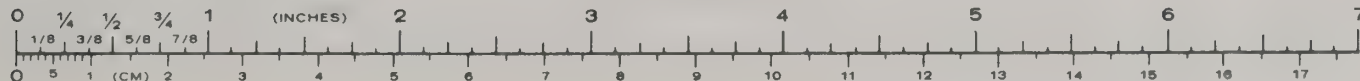
- (✓) Y101: 3579.545 kHz (3.579545 MHz) crystal (#404-238). First bend each lead at a right angle at the bottom of the crystal. Insert the leads into the circuit board holes and push the crystal down tight against the board. Then solder the leads to the foil and cut off the excess lead lengths.

PUSH DOWN
TIGHT AGAINST
BOARD

**CONTINUE** ➡

- (✓) Cut a 2" bare wire. Then form the wire over the crystal as shown and insert the wire ends into the nearby circuit board holes. Position the wire down tight against the crystal. Then solder the wire ends to the foil and cut off the excess wire ends.

POSITION
TIGHT AGAINST
CRYSTAL

**PICTORIAL 1-3**

START

- () Refer to Detail 1-4A (Illustration Booklet, Page 2) and prepare a 9-1/2" 3-wire cable. Then twist together the strands at each wire end and melt a small amount of solder on the wire ends to hold the strands together.

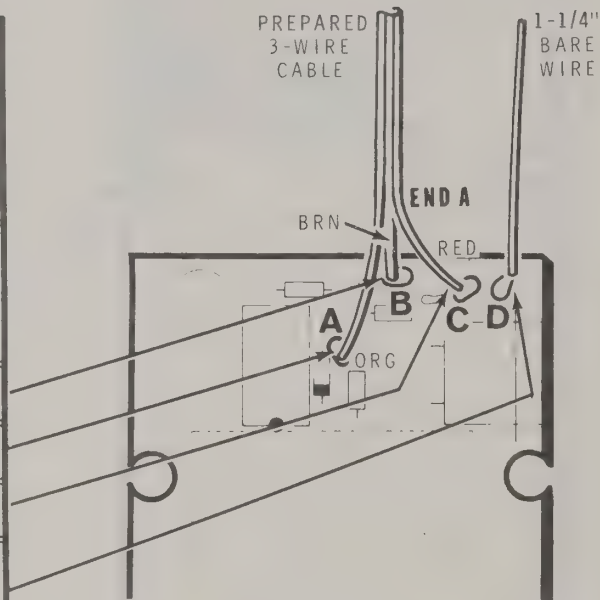
Connect **END A** of the prepared cable to the circuit board as follows. Solder each wire to the foil as you connect it and cut off the excess wire end.

- () Brown wire to hole B.

- () Orange wire to hole A.

- () Red wire to hole C.

- () Cut a 1-1/4" bare wire. Then connect one end of the wire to circuit board hole D. Solder the wire to the foil and cut off any excess wire end.

**PICTORIAL 1-4****CONTINUE****CIRCUIT BOARD CHECKOUT**

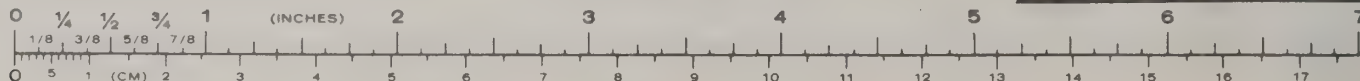
Carefully inspect the foil side of the circuit board for the following most commonly made errors.

- () Unsoldered connections.
- () Poor solder connections.
- () Solder bridges between foil patterns.
- () Protruding leads which could touch together.

Refer to the illustrations where the parts were installed as you make the following visual checks.

- () Integrated circuit for the proper installation.
- () Diode for the correct position of the banded end.

Proceed to "Installation."



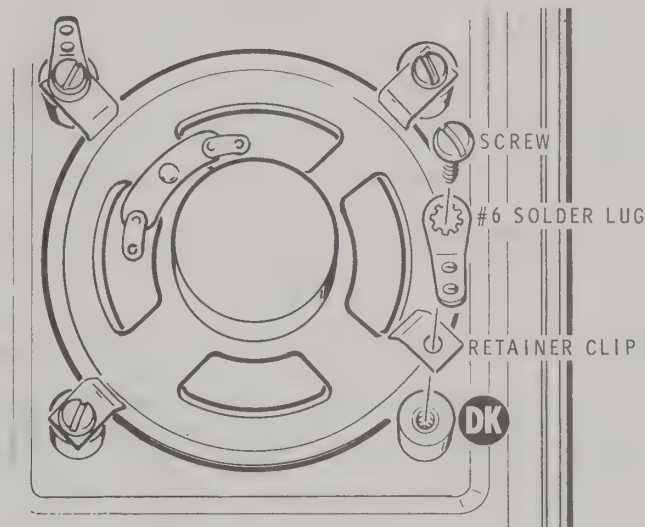
INSTALLATION

Refer to Pictorial 2-1 (Illustration Booklet, Page 1) for the following steps.

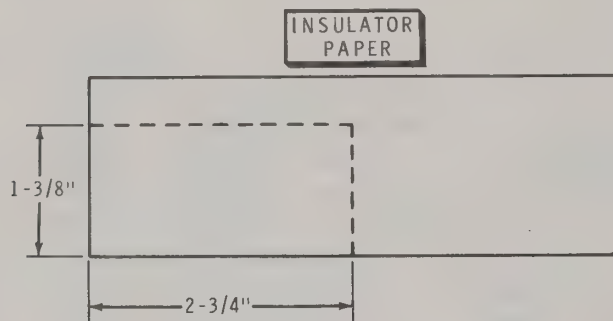
- () Remove the six screws from the case back on your Transceiver. Then remove the case back and set it aside temporarily.
- () Remove fuse F1 from your Transceiver.
- () Temporarily remove the six spacers from the Transceiver at BN, BP, BR, BS, BT, and BU. Then carefully remove the case front.

Refer to Pictorial 2-2 (Illustration Booklet, Page 3) for the following steps.

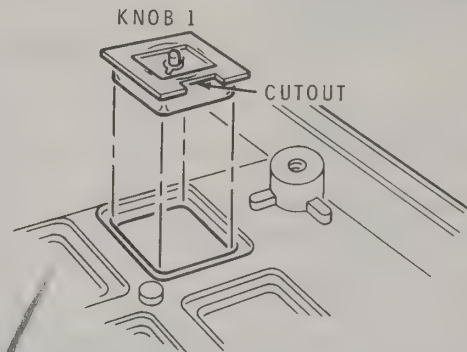
- () Position the case front as shown.
- () Temporarily remove the screw from the boss at DK on the case front. Then refer to Detail 2-2A and reinstall the screw with a #6 solder lug (and retainer clip). Be sure to position the solder lug as shown in the Pictorial.
- () Carefully peel and discard the foam gasket from the case front if this has not already been done. Also, remove all residual adhesive near the pushbutton holes.



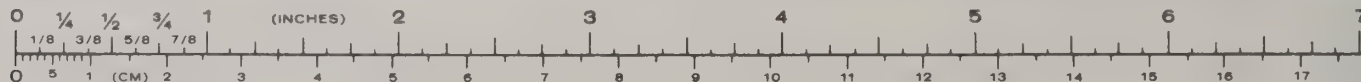
Detail 2-2A

**Detail 2-2B**

- () Refer to Detail 2-2B and cut a $1\text{-}\frac{3}{8}'' \times 2\text{-}\frac{3}{4}''$ piece of insulator paper.
- () Carefully peel away the backing paper from the insulator paper. Then press the insulator paper onto the case front as shown in the Pictorial. Be sure to line up the top edge of the insulator paper with the edge of the recess as shown.
- () Temporarily remove the spacers from the bosses at DL, DN, DP, and DR on the case front.
- () Carefully peel the front label from your Transceiver, if this has not already been done.

**Detail 2-2C**

- () Carefully peel the backing paper from the new front label. Then press the label into the recessed area in the case front. Be sure to install the label with the model number toward the top of the Transceiver.
- () Refer to Detail 2-2C and install pushbutton knob 1 in its hole in the case front as follows:
 1. Position knob 1 so the cutout in one edge is positioned as shown.
 2. Drop the knob into the indicated hole in the case front.
- () Similarly, drop the eleven remaining knobs into the proper holes in the case front as shown in the Pictorial. Be sure to install each knob into the correct hole. Also be sure the cutout in one edge of each knob is positioned as shown in the Pictorial.

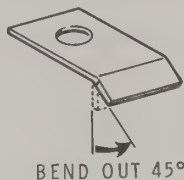




- () Scrape or sand away any excess plastic (left by the mold) from the side of the case front in the area shown in the Pictorial.
- () Cut three 2-1/4" lengths of foam tape.
- () Carefully peel the backing paper from each length of foam tape. Then press the tape onto the edges of the keys as shown in the Pictorial. The tape should cover only about 1/16" of the keys.

Refer to Pictorial 2-3 (Illustration Booklet, Page 4) for the following steps.

- () Install the Auto Patch Encoder circuit board onto the bosses at DL, DN, DP, and DR in the case front as shown.
- () Refer to Detail 2-3A and re-form the four retainer clips to a 45° angle as shown.



Detail 2-3A

- () Use four retainer clips and the four spacers you removed earlier to secure the circuit board to the case front.

NOTE: In the following steps, "S-" with a number, such as S-1, means to solder the connection. The number following the "S-" tells you how many wires are at the connection.

- () Connect the free end of the bare wire, coming from circuit board hole D, to solder lug DK (S-1).

Route the 3-wire cable coming from the circuit board under the speaker retainer clips at DG and DJ as shown. Then connect the free end of the cable to the Transceiver circuit board as follows:

- () Orange wire to the indicated foil (S-1). NOTE: There is no hole for this wire. There is, however, another orange wire already connected to this foil.
- () Red wire to hole A (S-1). NOTE: This hole is labelled on the component side of the circuit board.
- () Brown wire to the indicated circuit board hole (S-1). NOTE: This hole is not labelled. It is, however, next to the hole where another brown wire is already connected.

NOTE: The blue and white label shows the Model Number and Production Series Number of your kit. Refer to these numbers in any communications with the Heath Company about your kit. This assures you that you will receive the most complete and up-to-date information in return.

- () Carefully peel away the backing paper from the blue and white label. Then press the label onto the Auto Patch Encoder circuit board in the area shown in the Pictorial.
- () Reinstall the fuse at F1 in the Transceiver.

This completes the "Installation." Proceed to "Level Adjustment."

LEVEL ADJUSTMENT

Refer to Pictorial 3-1 (Illustration Booklet, Page 5) for the following steps.

NOTE: You may find it helpful to place a rubber band around the Transceiver case to keep the PTT bar depressed while you make the adjustment in the following steps. Remove the rubber band when you are directed to release the PTT bar.

() Turn the Transceiver on.

Use one of the following methods, listed in the order of accuracy, to adjust the Level control (R102) on your Auto Patch Encoder circuit board.

1. () Push the PTT bar on the Transceiver and at the same time push the “#” button on the Encoder keyboard. Then, while you observe a deviation monitor meter, adjust LEVEL control (R102) for 4.3 to 4.8 kHz of FM deviation. NOTE: To increase the deviation, turn the control in a counterclockwise direction.

2. () If a deviation monitor meter is not available, use on-the-air checks with other amateur radio operators. Check with three or four stations to get a consensus of opinion on recaptured audio in their receivers. Push the PTT bar on the Transceiver and the “#” button on the Encoder keyboard at the same time. Then adjust LEVEL control (R102) until the other operators say the deviation sounds correct.

NOTE: You may have to readjust the LEVEL control slightly to gain access to the auto patch.

- () Release the PTT bar on your Transceiver and turn the Transceiver off.

This completes the “Level Adjustment” of your Auto Patch Encoder. Proceed to “Final Assembly.”



FINAL ASSEMBLY

Refer to Pictorial 4-1 (Illustration Booklet, Page 6) for the following steps.

- () Use the six spacers removed earlier to reinstall the case front onto the Transceiver at BN, BP, BR, BS, BT, and BU.
- () Use the six screws removed earlier to reinstall the case back on your Transceiver.

NOTE: Your Auto Patch Encoder is now ready for operation. Since the access codes required by auto patch repeaters vary from machine to machine, these cannot possibly be covered in this Manual. Therefore, ask the particular repeater owner how to use the auto patch system in your area. Some repeater operators may require you to join a club or other group in your area before they allow you to use their auto patch.

IN CASE OF DIFFICULTY

The first part of this section of the Manual titled "Visual Tests," describes what to do about the difficulties that may occur right after your unit is assembled.

If the "Visual Tests" fail to clear up the problems, or if difficulties occur after your unit has been in use for some time, read the following information and then refer to the "Troubleshooting Chart."

VISUAL TESTS

1. About 90% of the kits that are returned to the Heath Company for service do not function properly due to poor connections and soldering. Therefore, you can eliminate many troubles by reheating all connections to make sure they are soldered as described in the "Kit Builders Guide."
2. Closely examine each circuit board foil in a good light to see that no solder bridges exist between adjacent connections. If available, use a magnifying glass for this purpose. Remove any solder bridges by holding a clean, hot soldering iron tip between the two points that are bridged until the excess solder flows down onto the tip. Compare your foil pattern against the "Circuit Board X-Ray View" on Page 21.
3. Check the diode for the correct installation.

4. Check the integrated circuit for the correct installation.
5. Check each resistor value carefully. Be sure in each step that the proper part has been wired into the circuit, as shown in the Pictorials.
6. Be sure all wires and leads connected to the circuit board have been trimmed as close as possible to the circuit board foils.
7. Try to analyze the symptoms of any problem you may have before starting any troubleshooting procedure. A review of the "Circuit Description" may also help you determine where the trouble is.

If the trouble is still not located after the "Visual Tests" are completed, and a voltmeter is available, check voltage readings against those shown on the "Schematic Diagram." Read the "Precautions for Troubleshooting" before you make any measurement. NOTE: All voltage readings were taken with a high input impedance voltmeter. Voltages may vary as much as $\pm 10\%$.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of your Transceiver Manual. Your Warranty is located inside the front cover of your Transceiver Manual.



PRECAUTIONS FOR TROUBLESHOOTING

CAUTION: Be very careful when you measure voltages so you do not damage circuit board components.

1. Be sure you do not short any adjacent foils when you make voltage

measurements. If the probe should slip, for example, and short together two adjacent connections, it is very likely to damage the integrated circuit. Although this component has an almost unlimited life when used properly, it is much more vulnerable to damage from excessive voltage or current than other parts.

Troubleshooting Chart

The following chart lists the "Condition" and the "Possible Cause" of some malfunctions. If a particular part is mentioned as a possible cause, check that part to see if it is incorrectly wired or installed improperly. Also check to see if an improper part was installed at that location. It is also possible, on rare occasions, for a part to be faulty.

CONDITION	POSSIBLE CAUSE
No tone frequencies are produced when you push any keyboard button.	1. Incorrect installation in Transceiver. 2. Y101. 3. U101 installed wrong. 4. Control R102 is set to minimum (fully counterclockwise). 5. C101 or C102.
Single-tone or no tone frequencies are produced when you push a particular keyboard button.	1. Keyboard/circuit board.

SPECIFICATIONS

Operating Voltage Range	10.0 to 16.0 VDC (from VF-2031 Transceiver).
Current Consumption	11 mA typical at 12.5 VDC.
Output Level (open circuit)	100 mV rms minimum at 12.5 VDC (single tone).
Output Source Resistance	4.7 k Ω or greater.
Frequency Tolerance*	$\pm 1\%$.
Operating Temperature Range	+14° to +140° F. (-10° to +60° C).
Total Distortion	5% (harmonic + intermodulation).

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

*Referenced to Dual-Tone Multi-Frequency (DTMF) telephone dialing standards.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (fold-in) while you read this "Circuit Description."

Integrated circuit U101 is the heart of the Auto Patch Encoder. U101 uses a 3.579545 MHz crystal reference to generate seven different audio sinusoidal frequencies, which are mixed together to provide tones suitable for Dual-Tone Multi-Frequency (DTMF) telephone dialing.

When you push a keyboard button, two of the input pins on U101 are connected together. This selects the proper digital dividers to divide the reference frequency to obtain the unique frequencies required. Further

processing of these frequencies takes place in U101 to produce the required dual-tone signal available at pin 16 of U101.

The dual-tone signal is applied across control R102. A portion of this signal is filtered by resistors R103 and R104 and capacitor C101. A clean signal is then applied to the modulator stage in the transmitter.

Zener diode D101 regulates the voltage applied to the encoder circuitry. Resistor R101 serves as a dropping resistor for the supply voltage.

CIRCUIT BOARD X-RAY VIEW

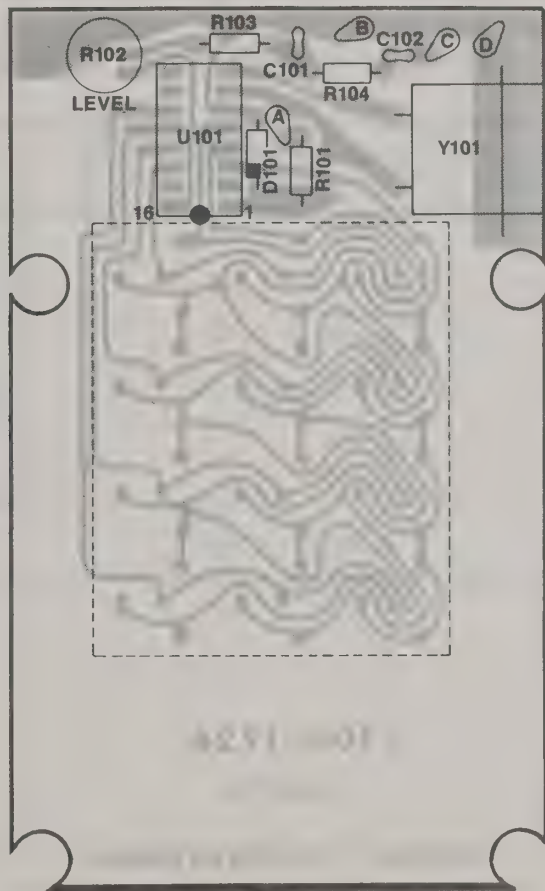
NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

A. Find the circuit component number (R102, C101, etc.) on the "Circuit Board X-Ray View."

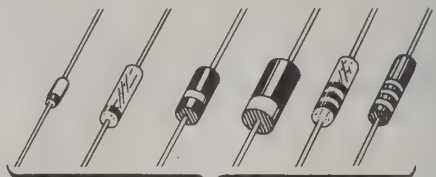
B. Locate this same number in the "Circuit Component Number" column of the "Parts List."

C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION, which you must supply when you order a replacement part.

(Shown from component side)

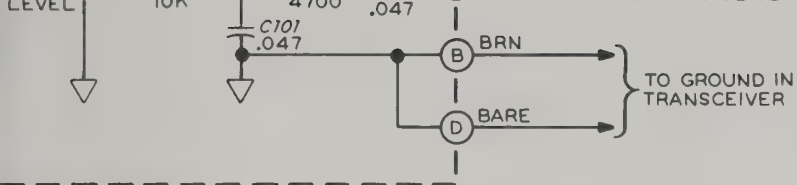


SEMICONDUCTOR IDENTIFICATION CHART

HEATH PART NUMBER	MAY BE REPLACED WITH	CIRCUIT COMPONENT NUMBER	IDENTIFICATION
56-19	VR-9.1	D101	NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. ALWAYS POSITION THE BANDED END AS SHOWN ON THE CIRCUIT BOARD.  Diagram showing six different diode shapes, all with a banded end. A bracket below them is labeled "BANDED END".



HEATH PART NUMBER	MAY BE REPLACED WITH	CIRCUIT COMPONENT NUMBER	IDENTIFICATION
442-660	5087	U101	(TOP VIEW) V(+) 1 16 TONE OUTPUT XMTR 2 15 INVALID SWITCH TONE SELECT COL 1 3 14 ROW 1 COL 2 4 13 ROW 2 COL 3 5 12 ROW 3 V(-) 6 11 ROW 4 OSC 2 7 10 MUTE SWITCH OSC 1 8 9 COL 4



- THIS SYMBOL INDICATES CIRCUIT BOARD GROUND.
- THIS SYMBOL INDICATES A CONNECTION TO THE CIRCUIT BOARD.

W NE (Hz)	HIGH TONE (Hz)		
	1209	1336	1477
	1	2	3
	4	5	6
	7	8	9
	*	0	#

-TONE OUTPUT FREQUENCIES

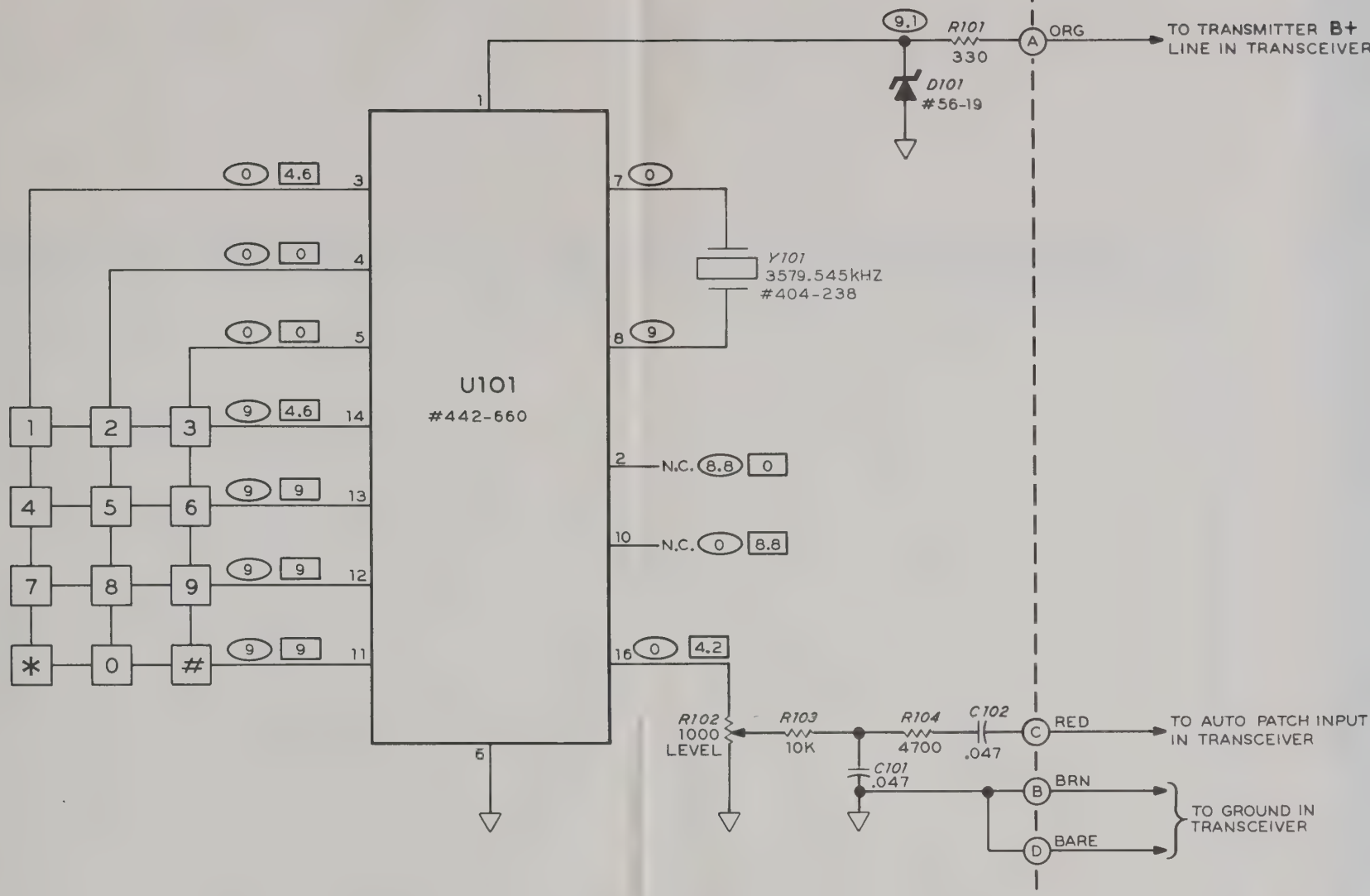
Part of 595-2242-02

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NOTES:

1. REFER TO THE CIRCUIT BOARD X-RAY VIEW FOR THE PHYSICAL LOCATION OF PARTS.
2. RESISTORS ARE 1/4-WATT, 5% TOLERANCE. RESISTOR VALUES ARE IN OHMS (k=1000).
3. CAPACITOR VALUES ARE IN μ F (MICROFARADS).
4. DC VOLTAGE MEASUREMENTS WERE TAKEN WITH A HIGH INPUT IMPEDANCE VOLTMETER FROM THE POINTS INDICATED TO CIRCUIT BOARD GROUND. VOLTAGES MAY VARY $\pm 10\%$. VOLTAGES ARE ONLY APPLIED TO THE CIRCUIT BOARD WHEN THE TRANSCEIVER IS IN THE TRANSMIT MODE.
5. THIS SYMBOL INDICATES A DC VOLTAGE WITH NO TONE BEING PRODUCED AND THE PTT BAR ON THE TRANSCEIVER DEPRESSED.
6. THIS SYMBOL INDICATES A DC VOLTAGE WITH KEY "1" PUSHED AND THE PTT BAR ON THE TRANSCEIVER DEPRESSED.

7. THIS SYMBOL INDICATES CIRCUIT BOARD GROUND.
8. THIS SYMBOL INDICATES A CONNECTION TO THE CIRCUIT BOARD.

LOW TONE (Hz)	HIGH TONE (Hz)		
	1209	1336	1477
697	1	2	3
770	4	5	6
852	7	8	9
941	*	0	#

TWO-TONE OUTPUT FREQUENCIES

SCHEMATIC OF THE HEATHKIT® AUTO PATCH ENCODER MODEL VFA-2031-3

Part of 595-2242-02

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NOTES:

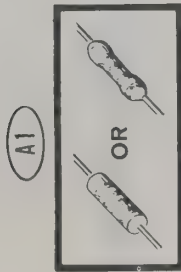
1. REFER TO THE CIRCUIT BOARD X-RAY VIEW FOR THE PHYSICAL LOCATION OF PARTS.
2. RESISTORS ARE 1/4-WATT, 5% TOLERANCE. RESISTOR VALUES ARE IN OHMS (k=1000).
3. CAPACITOR VALUES ARE IN μ F (MICROFARADS).
4. DC VOLTAGE MEASUREMENTS WERE TAKEN WITH A HIGH INPUT IMPEDANCE VOLTMETER FROM THE POINTS INDICATED TO CIRCUIT BOARD GROUND. VOLTAGES MAY VARY $\pm 10\%$. VOLTAGES ARE ONLY APPLIED TO THE CIRCUIT BOARD WHEN THE TRANSCEIVER IS IN THE TRANSMIT MODE.
5.  THIS SYMBOL INDICATES A DC VOLTAGE WITH NO TONE BEING PRODUCED AND THE PTT BAR ON THE TRANSCEIVER DEPRESSED.
6.  THIS SYMBOL INDICATES A DC VOLTAGE WITH KEY "1" PUSHED AND THE PTT BAR ON THE TRANSCEIVER DEPRESSED.

SCHEMATIC OF T
HEATHKIT®
AUTO PATCH ENC
MODEL VFA-203

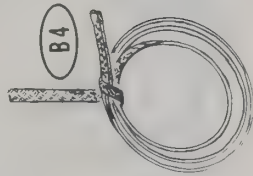
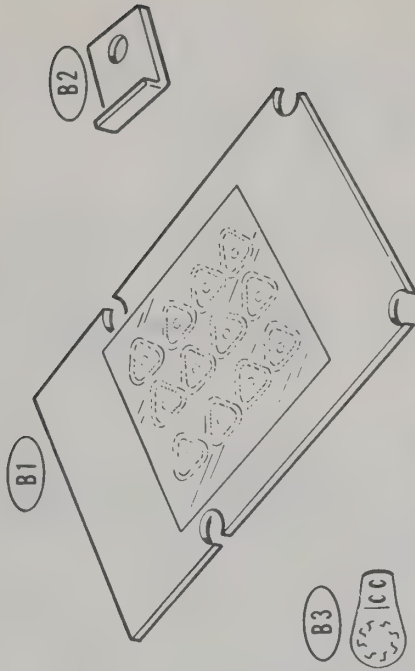
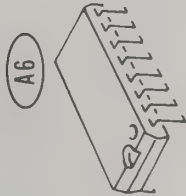
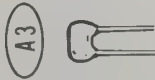
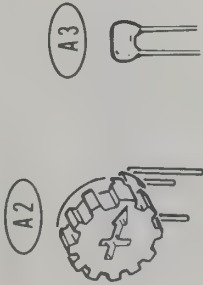
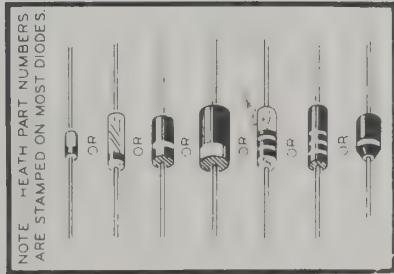
ILLUSTRATION BOOKLET

PARTS PICTORIAL

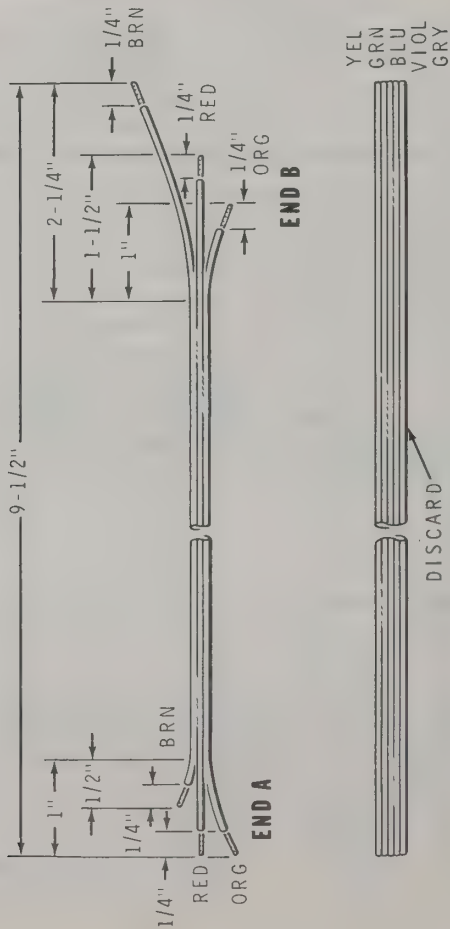
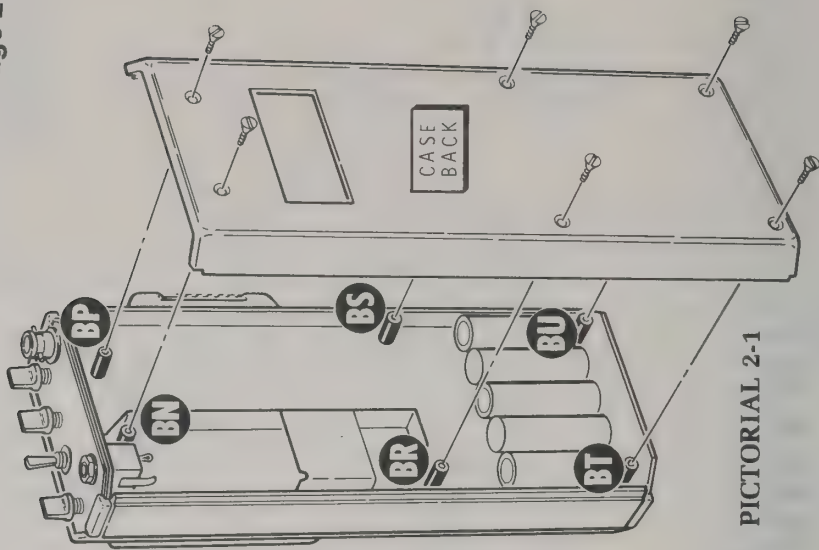
Part of 595-2242-02

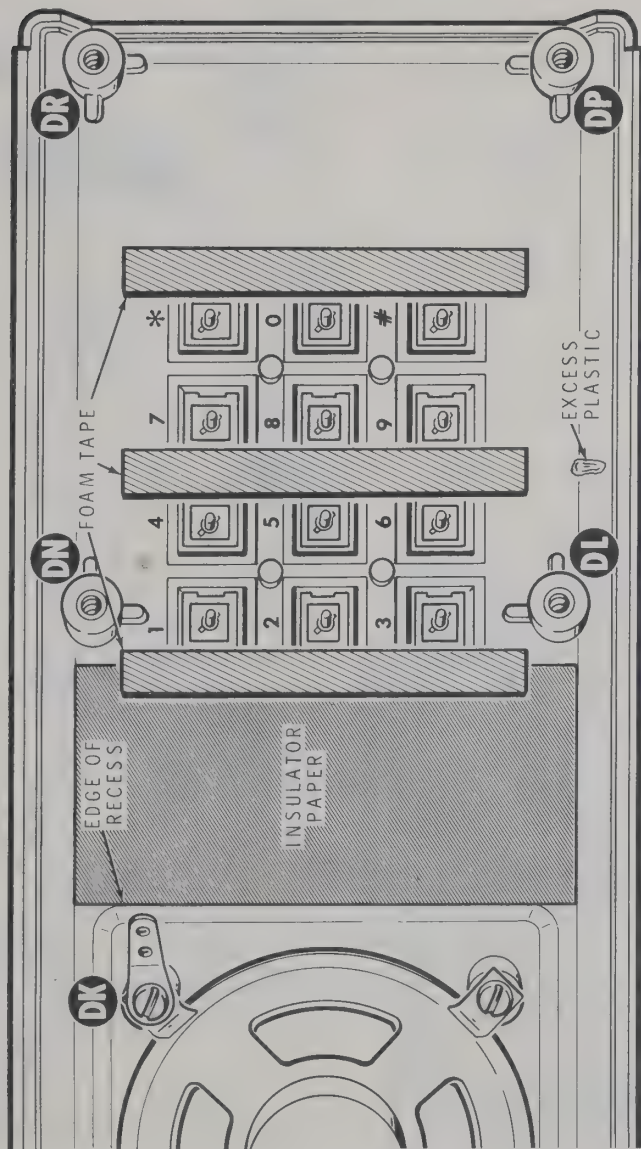


A4

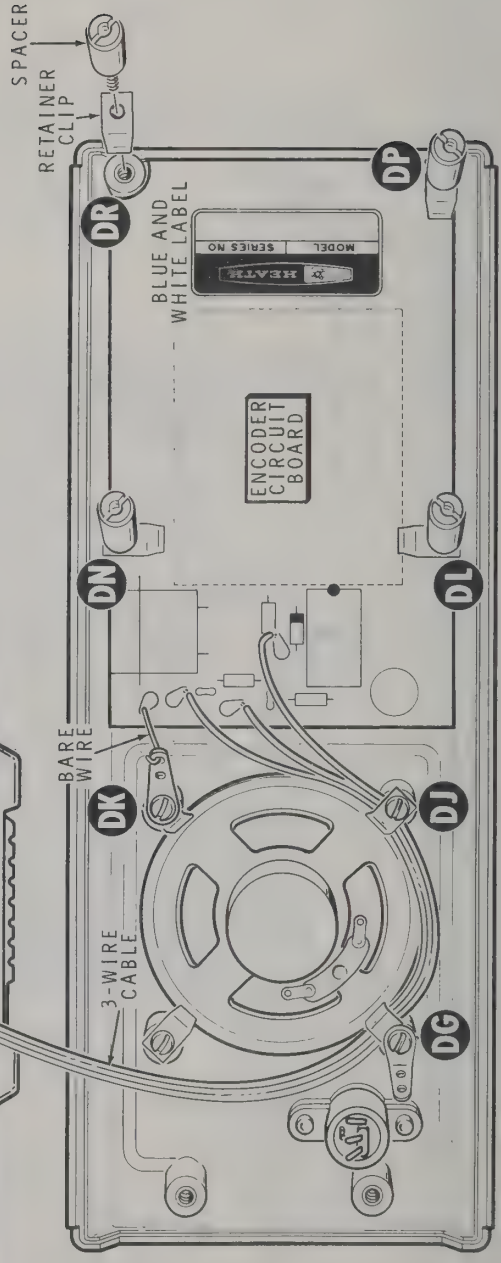
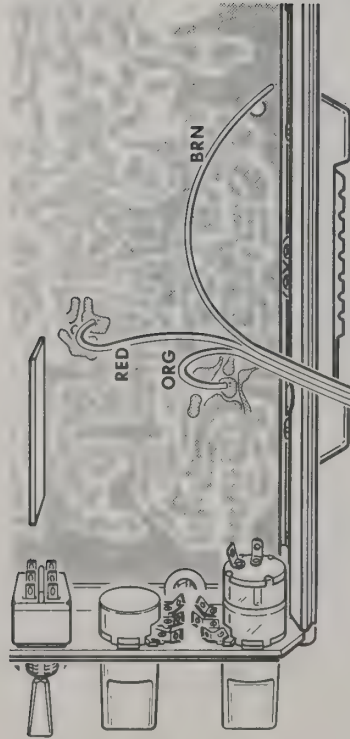


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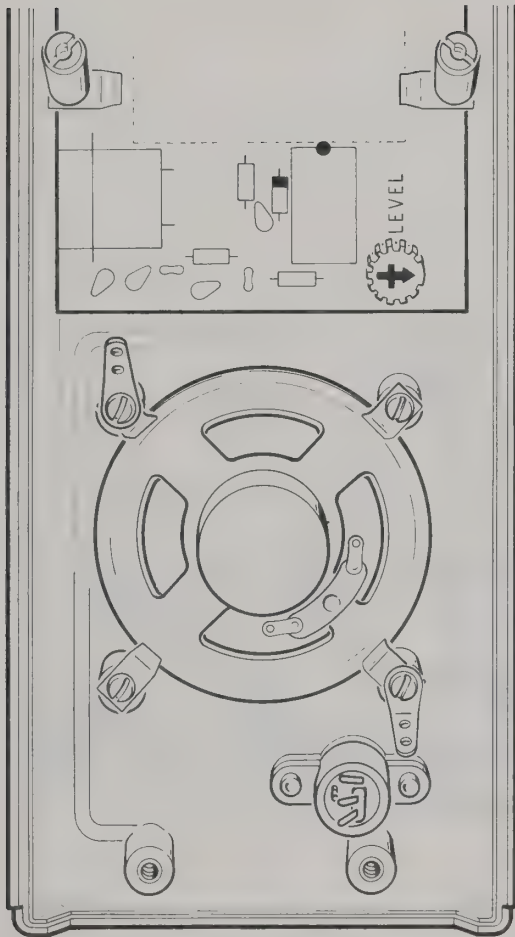




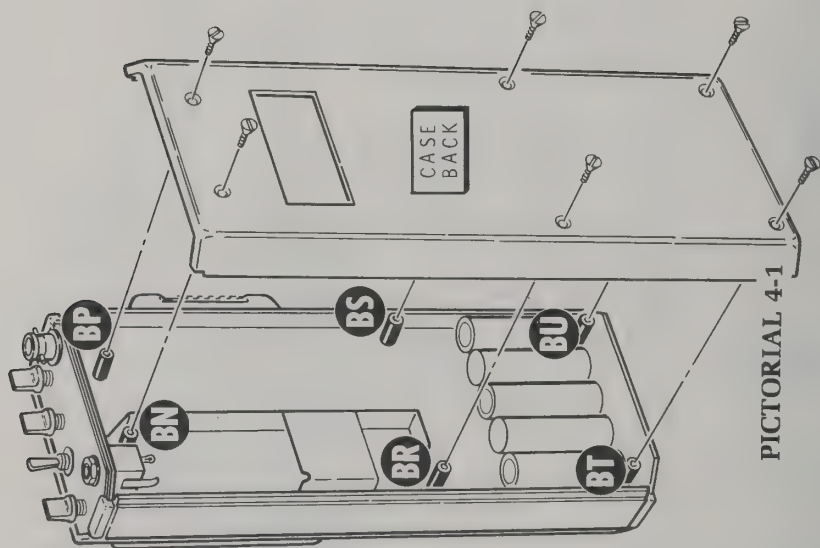
PICTORIAL 2-2



PICTORIAL 2-3



PICTORIAL 3-1



PICTORIAL 4-1

NAME

ADDRESS

CITY

STATE

ZIP

ATT: PARTS DEPARTMENT

Heath Company

BENTON HARBOR
MICHIGAN 49022

Put stamp here.
The Post Office
will not deliver
mail without
postage.

- BE SURE YOUR NAME, ADDRESS AND ZIP CODE ARE PRINTED CLEARLY.

- BE SURE HEATH PART NUMBERS ARE USED.

- BE SURE WARRANTY INFORMATION IS COMPLETE.

- BE SURE PAYMENT IS ENCLOSED FOR PREPAID ORDERS.

- (DO NOT SEND CASH)

***** WRITE HEATH COMPANY FOR PRICE INFORMATION.
@ PRICE PER FOOT.

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HEATH PARTS PRICE LIST
VFA-2031- 3 ECL 02

12/20/79

PAGE 1 OF 1

KEEP THIS PARTS LIST WITH YOUR MANUAL AND USE THE PRICES SHOWN BELOW WHEN ORDERING PARTS. THESE PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

THE PRICES SHOWN ON THE "HEATH PARTS PRICE LIST" APPLY ONLY ON PURCHASES FROM THE HEATH COMPANY WHERE SHIPMENT IS TO A U.S.A. DESTINATION. ADD 10% (MINIMUM 25 CENTS) TO THE PRICE WHEN ORDERING (MICHIGAN RESIDENTS ADD 4% SALES TAX) TO COVER INSURANCE, POSTAGE, AND HANDLING. OUTSIDE THE U.S.A., PARTS AND SERVICE ARE AVAILABLE FROM YOUR LOCAL HEATHKIT SOURCE AND WILL REFLECT ADDITIONAL TRANSPORTATION, TAXES, DUTIES, AND RATES OF EXCHANGE.

ADDITIONAL 3 FT ROLLS OF SOLDER, #331-6, CAN BE ORDERED FOR 25 CENTS EACH.

PART NUMBER	PRICE	*	PART NUMBER	PRICE	*	PART NUMBER	PRICE	*	PART NUMBER	PRICE	*
6- 103-12	.25	*			*			*			*
6- 331-12	.25	*			*			*			*
6- 472-12	.25	*			*			*			*
10- 990	2.05	*			*			*			*
21- 182	.85	*			*			*			*
56- 19	.75	*			*			*			*
73- 39	.15@	*			*			*			*
75- 103	.35	*			*			*			*
75- 718	.45	*			*			*			*
100-1726	7.10	*			*			*			*
258- 730	.30	*			*			*			*
259- 1	.05	*			*			*			*
340- 3	.05@	*			*			*			*
347- 55	.30@	*			*			*			*
390-1503	2.35	*			*			*			*
404- 238	2.80	*			*			*			*
442- 660	9.00	*			*			*			*
462-1063	3.35	*			*			*			*
490- 185	.35	*			*			*			*

***** WRITE HEATH COMPANY FOR PRICE INFORMATION.
@ PRICE PER FOOT.

HEATH PARTS PRICE LIST

VFA-2031- 3 ECL 02

12/20/79

PAGE 1 OF 1

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6- 331-12	.25	*			*			*			*
6- 472-12	.25	*			*			*			*
10- 990	2.05	*			*			*			*
21- 182	.85	*			*			*			*
56- 19	.75	*			*			*			*
73- 39	.15	*			*			*			*
75- 103	.35	*			*			*			*
75- 718	.45	*			*			*			*
100-1726	7.10	*			*			*			*
258- 730	.30	*			*			*			*
259- 1	.05	*			*			*			*
340- 3	.05	*			*			*			*
347- 55	.30	*			*			*			*
390- 1503	2.35	*			*			*			*
404- 238	2.80	*			*			*			*
442- 660	9.00	*			*			*			*
462- 1063	3.35	*			*			*			*
490- 185	.35	*			*			*			*

FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

INSTRUCTIONS

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, \$3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.
- Total enclosed \$_____
- If you prefer COD shipment, check the COD box and mail this card.
- ☐ COD

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

D LINE

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HEATH PARTS PRICE LIST VFA-2031- 3 ECL 02

12/20/79

PAGE 1 OF 1

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21- 182	.85	*			*			*			*
56- 19	.75	*			*			*			*
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462- 1063	3.35	*			*			*			*
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Total enclosed \$ _____

- If you prefer COD shipment, check the COD box and mail this card. COD ☐

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # _____ Invoice # _____

Date _____ Location _____

Purchased _____ Purchased _____

LIST HEATH PART NUMBER	QTY	PRICE EACH	TOTAL PRICE

TOTAL FOR PARTS

HANDLING AND SHIPPING

MICHIGAN RESIDENTS ADD 4% TAX

TOTAL AMOUNT OF ORDER

SEND TO: **HEATH COMPANY**
BENTON HARBOR
MICHIGAN 49022
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

FOR PARTS REQUESTS ONLY

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Model # _____ Invoice # _____
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Purchased _____ Purchased _____

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TOTAL FOR PARTS

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TOTAL AMOUNT OF ORDER

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BENTON HARBOR
MICHIGAN 49022
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

CUT ALONG DO

CUSTOMER SERVICE

REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

Replacement parts are maintained specifically to repair Heath products. Parts sales for other reasons will be declined.

ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company
Benton Harbor
MI 49022
Attn: Parts Replacement

Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.

OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least **THREE INCHES** of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022



HEATH COMPANY • BENTON HARBOR, MICHIGAN
THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

LITHO IN U.S.A.